FORUM

ARS Scientists: All-Purpose Agronomists

From the flowerpot to the crop field, Agricultural Research Service scientists tackle issues that pay off in a homeowner's pride, a golfer's putt, a farmer's profits—and the nation's environmental protection.

For instance, one of the biggest issues facing farmers today is deciding how to manage their crop fields: till or no-till? The costs of transitioning from conventional to no-till farming can be considerable, so farmers are not always eager to make the switch.

Soil scientist David Huggins, who works at the ARS Land Management and Water Conservation Research Unit in Pullman, Washington, is looking for data that will give producers another reason to consider using no-till in Washington's rolling fields of winter wheat. In this region, known as "the Palouse," every slope and aspect can affect crop performance and crop yield—and managing dryland production is made even more challenging by the way the complex landscape and variations in soil affect the soil's water-storage capacities.

One morning, as Huggins watched a blizzard blowing outside his window, he decided to investigate how snow retention differed on no-till fields and conventional fields and how the differences affected the storage of soil water. For 2 years, he manually measured snow depth and density and soil water storage at hundreds of points across a no-till crop field and a conventional-till crop field.

Huggins found that standing wheat residue on the no-till field significantly increased the amount and uniformity of snow cover across the entire field, a pattern that resulted in a more uniform distribution of soil water and that increased soil water recharge rates. By his calculations, this could add up to increased profits from winter wheat by an average of $30 per acre and as much as $54 per ridge-top acre—findings that underscore the current advantages of no-till management. You can read more about this study, summarized on page 8.

What about the advantages of no-till for farmers in the future? At the ARS Agricultural Systems Research Unit in Fort Collins, Colorado, research leader Laj Ahuja conducted several modeling studies that simulated the effects of climate change projections on three crop rotation systems—wheat-fallow, wheat-corn-fallow, and wheat-corn-millet—to see how yields might be affected by future climate shifts. In one study, his simulations projected higher wheat yields resulting from no-till management, because evaporation rates were lower in fields protected by crop residues, which led to higher levels of soil water retention. His modeling indicated that as air temperatures and atmospheric CO_2 concentrations increase, wheat yields from no-till wheat-fallow rotations are expected to exceed yields produced with conventional tillage through the year 2075. This story begins on page 6.

ARS research also extends to turfgrass and ornamental crops—always with an eye on protecting the environment. For example, as golf courses strive to become even "greener," a major concern is that pesticides and nutrients used to maintain play-worthy turf can be carried into nearby waterways via runoff. A story in an upcoming magazine issue will feature ARS work showing how the type of core cultivation affects pesticide transport and nutrient concentrations in runoff from the turf.

Ornamental crops need care and feeding just like turfgrass and field crops do, and their fertilizers contain compounds to help the flowers take up needed micronutrients. But these compounds, called "chelating agents," don't break down easily in the soil and may be one source of iron and other heavy metals found in nearby surface waterways.

Horticulturalist Joseph Albano, who works at the U.S. Horticultural Research Laboratory in Fort Pierce, Florida, has found a promising alternative to these chelating agents. In several greenhouse studies, Albano used EDDS—a readily biodegradable chelating agent—and observed that there was no significant difference in the health, growth patterns, or micronutrient levels in marigolds grown with EDDS and marigolds grown with other popular iron chelating agents. Since EDDS is biodegradable, it will not persist in the environment and is less likely to take up heavy metals in soils and transport them waterways. The story on page 22 has more details on this research.

A planter filled with marigolds. A turfgrass fairway that accommodates an endless parade of golfers. A field of wheat covering the rolling hills of the Palouse or flourishing on Colorado's high plains.

ARS has a hand in all of them.

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